Evaluation of functional disability and associated factors in the elderly

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Abstract

Objective: To estimate the prevalence and self-reported socio-demographic and health factors associated with functional disability in basic and instrumental activities of daily living among the elderly. *Method*: A cross-sectional study was carried out, based on a representative sample of elderly people receiving care at a reference unit in the north of the state of Minas Gerais. The data were collected in 2015. Demographic and socioeconomic variables, morbidity, hospitalizations in the previous year, frailty (Edmonton Frail Scale), geriatric depression (GDS-15), and functional disability (Katz Index, Lawton and Brody Scales) were analyzed. Multiple analysis was performed using Poisson regression with robust variance. *Results*: 360 elderly people aged 65 years and over participated in the study. The prevalence of functional disability for Basic Activities of Daily Living was 21.4% while for instrumental activities it was 78.3%. Functional disability in basic activities was higher among elderly males (p=0.03) who had suffered strokes (p=0.00) and were frail (p=0.00), while for instrumental activities it was higher among older elderly persons (p=0.04); who were illiterate (p=0.00), had less than five years of schooling (p=0.02); had depressive symptoms (p=0.00) and were frail (p=0.00). It was lower among elderly persons who lived alone. *Conclusion*: A high prevalence of functional disability was identified among the elderly for instrumental activities of daily living, demonstrating the need for an effective and immediate approach by health professionals, who should employ preventive care in order to tackle this problem.

Keywords: Health of the Elderly. Activities of Daily Living. Functionality.

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INTRODUCTION

The process of aging of the population is a worldwide phenomenon that occurs slowly but gradually in developed countries but much more swiftly in emerging countries like Brazil[1]. With this expansion, the additional years of life should be analyzed from a qualitative standpoint, as it is essential to provide better health conditions for elderly people, so that they may experience an active, healthy and functional aging process, with regard to carrying out their needs, for as long as possible[2].

Functional capacity can be defined as a set of physical and mental skills that are essential for the unaided execution of activities of daily living. For elderly people, this issue means that they are capable of carrying out activities and making decisions within their daily routine. In contrast, functional disability represents the dependence of this individual on others when carrying out such tasks[3].

These tasks can be divided into three broad categories, namely: Basic Activities of Daily Living (BADL) which include basic activities such as self-care, as determined by health, work, leisure and self-knowledge; Advanced Activities of Daily Living (AADL), a set of leisure activities, independent of work pursuits, educational activities, social participation, which depend on personal motivation; and, finally, Instrumental Activities of Daily Living (IADL), which refer to the capacity to carry out more complex activities, and which are therefore linked to the independence of the elderly person, given that some independence is necessary for executing such activities. The IADLs are characterized by work and by social contact, including meeting up with friends and participating in the community at large[3,4].

As functional disability may reduce the degree of independence when carrying out basic and instrumental activities, it is important to investigate the impact that this condition has upon the general lives of elderly people and also upon the health services. Evaluating the functional disability of elderly people is extremely important, as it can provide a basis for providing high-quality care and social services[5].

The main purpose of the present study was to calculate the prevalence of functional disability in basic and instrumental activities of daily living among the elderly and to examine the social, demographic and self-reported health factors associated with this phenomenon.

METHOD

This cross-sectional design and analytic study was carried out at a Reference Unit for the Health of the Elderly (RUHE) for outpatient treatment, in the northern part of the Brazilian state of Minas Gerais. This region has low Human Development Indices (HDIs), similar to those of the Brazilian Northeast, the poorest and least developed part of the country. The region is also an area of serious and unique social vulnerability[6]. This means that even a city of medium size suffers certain specific conditions, suggesting a need for studies focused on their specific particularities.

The subjects participating in the study were elderly people aged 65 and over, who were undergoing treatment between May and July 2015. The evaluated group was selected based on unintentional convenience sampling, based on the needs being attended to, considering the difficulties of making a random selection.

For the calculation of the sample size, a level of significance of 5% was applied, which is equivalent to a confidence interval of 95% and a tolerable sampling error of 3%. This first estimate of sample size was increased by 20%, in order to explore adjusted associations between the independent variables and functional disability. The minimum number was 360 elderly people.

The population sample was created based on the following criteria for inclusion: age of 65 years old or over and be undergoing treatment at the RUHE concerned. The criteria for exclusion were: any disability or incapacity which, as appraised by the family, or any hearing impairment, as yet unremedied, that would prevent the understanding of the questions asked. Disability according to the appraisal of the family was taken as a plausible measure, in the light

of the complexity involved in the administration of a specific instrument for such an evaluation. In this case, before starting the interview, the data collection instrument was presented to the family, who then decided whether or not the elderly person was able to take part in the interview.

To carry out the multidimensional interview with the target public, the interviewers were trained and calibrated in advance (kappa ≥ 0.8). The data was collected at the RUHE in both the morning and the afternoon.

The instruments for data collection, as used for this paper, were based on similar studies[6,7] and were previously tested in a pilot study conducted at this same location, with 20 elderly people who were not included in the analysis. For data collection, the following instruments were used: the BADL (Katz index[8]) and IADL (the Lawton and Brody Scale[9]) scales; the Edmonton Frail Scale[10], including the Clock Drawing Test[11], which is part of this instrument; the Geriatric Depression Scale[12], and also a questionnaire applied to the elderly person containing several social, demographic, epidemiological and clinical variables.

The independent social and demographic variables were: gender; age group (aged between 65 and 79, and aged 80 or over); white or non-white skin, as self-described; relationship status (with or without partner); living conditions (alone or with partner, family or friends); level of schooling (up to 4 years of schooling, and 5 or more years of schooling); literacy (yes or no); monthly family income (up to one Brazilian national minimum wage – MW, and more than one MW).

Clinical aspects refer to: the presence of chronic and non-contagious illnesses as self-reported, checked by means of the application of a second questionnaire to the elderly person: *diabetes mellitus* (DM); heart disease; bone and joint disease, stroke); symptoms of depression, according to the point score on the Geriatric Depression Scale: ≥ 6 points or < 6 points[12]; records of falls; hospitalizations over the past year; and degree of frailty.

Frailty was evaluated using the point score based on the Edmonton Frail Scale - EFS[10], which includes factors as follows: cognition, state of health; functional independence; social support; use of medication; nutrition; general mood; urinary continence; and functional performance. These domains are divided into 11 items, and the entire scale has scores ranging from zero to 17 points. The Edmonton Frail Scale (EFS) considers the elderly person as not frail when the score is between zero and 4 points (inclusive); *vulnerable to frailty* when the score is 5 or 6 points; suffering *mild frailty* for scores of 7 or 8 points; experiencing *moderate frailty* for scores of 9 or 10 points, and having *severe frailty* as those with scores ≥ 11 points[10].

In this study, for data analysis, the results of the independent variable were separated into two levels: absence of frailty (final score ≤ 6) and presence of frailty (final score > 6).

Cognition was evaluated through the Clock Drawing Test (CDT), which is part of the instrument used for the evaluation of frailty. The interpretation of the CDT is based on a score from 0 to 5 points. Five points are awarded for a drawing of a perfect clock, with small deviations concerning the position and the spacing of the numbers acceptable; in contrast, a score of 0 is assigned to those who are unable to reproduce a drawing of a clock, and those who refuse to take the test[11]. The CDT was not included in the bivariate or multivariate analysis, due to the fact that its connection with functional disability is already well covered and described in specialist literature. The non-inclusion of this variable in the statistical model for analysis may allow the expression of variables as yet little explored, and which should be discussed.

Functional disability, a dependent variable, was defined based on the limitations of the BADL, which were measured by the Katz Index[8]. The limitations on the IADL were evaluated by the Lawton and Brody Scale[9], which includes more complex items of daily living. Based on the Lawton and Brody Scale[9], the elderly people are considered independent for IADL when they score 27 points, while those with 26 points or less are considered dependent in this regard[13].

The Katz Index establishes a point score ranging from 0 to 3 points. The elderly person is totally independent for BADL with a score of 0; one point is awarded to those who need the help of an accessory

(such as walking sticks, Zimmer frames, support on furniture) to carry out activities; a score of two points means that human help is essential for the elderly person to carry our his or her tasks; and finally a score of three for BADL shows that the person is fully dependent[8]. Both the BADL and IADL scores have been recommended by the Brazilian Ministry of Health, and have been validated and adapted for use in Brazil[13].

For the calculation of the statistical significance of this association, the Chi-squared (χ^2) Test was used. Prevalence ratios (PR) were calculated in order to investigate the existence of associations between different independent variables and functional disability. The adjusted prevalence ratios were obtained through multiple Poisson regression analysis with robust variance, considering the independent variables most strongly linked to functional disability in bivariate analysis (up to a level of significance less than 0.20). For the final analysis, a final significance level of 0.05 ($p<0.05$) was considered.

The information thus collected was analysed through the *Statistical Package for the Social Sciences (SPSS),* version 17.0 *(SPSS for Windows,* Chicago, USA). The variables with $p \leq 0.05$ were considered statistically significant.

This study was approved by the Research Ethics Committee of the Universidade Estadual de Montes Claros, under Opinion Statement No. 1,003,534, and all the participants signed a Free and Informed Consent Form (ICF).

RESULTS

A total of 360 elderly people were interviewed: 78.1% of these were female. The prevailing age group was 65 and 79 years old [the mean age was 75.14 years; (±7.6)]. A total of 58.6% of the sample were literate; however, 85.8% had a low level of schooling, of four years at most; 62.5% of the elderly people in the sample declared themselves as white; 68.1% had a family income of more than one Brazilian national minimum wage (MW), and 83.1% lived with a partner or some other family member.

A total of 21.4% of the elderly people exhibited some functional disability for BADL, while 78.3% suffered disability for IADL. The evaluation of cognition through the Clock Drawing Test (CDT) showed that 79.2% of the elderly people evaluated had some degree of cognitive decline.

The bivariate analyses performed for functional disability for BADL and IADL and the other variables, are shown in Table 1.

We identified an association at a level of 20% ($p<0.20$) between BADL and the other variables considered: gender; family configuration; symptoms of depression; stroke (CVA); falls; periods in hospital; and frailty. In the case of IADL, there were associations with level of schooling; family configuration; literacy (knowing how to read); age; presence of diabetes; symptoms of depression; and frailty (Table 1).

The prevalence of functional disability for BADL was greater among elderly men who had had strokes and were considered frail (Table 2).

Functional deficiency for IADL was greater among the elderly people of more advanced age; those who were illiterate; those with less than five years of schooling; those who showed symptoms of depression and those classed as frail; and lower among the elderly people who lived alone, when compared to those living with spouse, partner or family (Table 3).

Table 1. Bivariate analyses between degrees of dependence for BADL and IADL and independent variables, in elderly people receiving care at a Reference Unit for the Health of the Elderly (RUHE) (N=360) in the city of Montes Claros, Minas Gerais, Brazil, 2015.

Independent Variables	Basic Activities of Daily Living (BADL)		*p*-value	Instrumental Activities of Daily Living (IADL)		*p*-value
	DEP*	IND**		DEP	IND	
	n(%)	n(%)		n(%)	n(%)	
Gender			0.021			0.33
Male	24 (30.4)	55(69.6)		65(82.3)	14(17.7)	
Female	53(18.9)	228(81.1)		217(77.2)	64(22.8)	
Age			0.232			**<0.001**
Up to 79 years	54(19.9)	217(80.1)		201(74.2)	70(25.8)	
80 years and over	23(25.8)	66(74.2)		81(91.0)	8(9.0)	
Skin			0.813			0.121
White	28(20.7)	107(79.3)		100(74.1)	35(25.9)	
Non-white	49(21.8)	176(78.2)		182(80.9)	43(19.1)	
Marital Status			0,461			0.534
With partner	34(23.3)	112(76,7)		112(76.7)	34(23.3)	
Without partner	43(20.1)	171(79,9)		170(79..4)	44(20.6)	
Literacy			0,412			**<0.001**
Yes	42(19.9)	169(80.1)		148(70.1)	63(29.9)	
No	35(23.5)	114(76.5)		134(89.9)	15(10.1)	
Schooling			0,684			**<0.001**
5 years and over	12(23.5)	39(76.5)		23(45.1)	28(54.9)	
Up to 4 years	65(21.0)	244(79.0)		259(83.8)	50(16.2)	
Family configuration			0,011			<0.001
Lives with partner, family members of friends	71(23.7)	228(76.3)		242(80.9)	57(19.1)	
Lives alone	6(9.8)	55(90.2)		40(65.6)	21(34..4)	
Has own income			0.951			0.392
Yes	75(21.4)	276(78.6)		276(78.6)	75(21.4)	
No	2(22.2)	7(77.8)		6(66.7)	3(33.3)	
Category of family income			0.911			0.564
More than 1 Brazilian Minimum Wage (MW)	52(21.2)	193(78.8)		194(79.2)	51(20.8)	
1 MW or less	25(21.7)	90(78.3)		88(76.5)	27(23.5)	
Has *diabetes mellitus*			0.901			**0.181**
Yes	16(21.9)	57(78.1)		53(72.6)	20(27.4)	
No	61(21.3)	226(78.7)		229(79.8)	58(20.2)	
Heart problem			0.731			
Yes	18(22.8)	61(77.2)		65(82.3)	14(17.7)	
No	59(21.0)	222(79.0)		217(77.2)	64(22.8)	
Malignant tumour			0.713			0.126
Yes	4(25.0)	12(75.0)		15(93.8)	1(6.2)	
No	73(21.2)	271(78.8)		267(77.6)	77(22.4)	

to be continued

Continuation of Table 1

Independent Variables	Basic Activities of Daily Living (BADL)		*p*-value	Instrumental Activities of Daily Living (IADL)		*p*-value
	DEP* n(%)	IND** n(%)		DEP n(%)	IND n(%)	
Bone and joint disease			0.564			0.082
Yes	36(22.8)	122(77.2)		117(74.1)	41(25.9)	
No	41(20.3)	161(79.7)		165(81.7)	37(18.3)	
Osteoporosis			0.312			0.714
Yes	30(24.4)	93(75.6)		95(77.2)	28(22.8)	
No	47(19.8)	190(80.2)		187(78.9)	50(21.1)	
Stroke - CVA***			**<0.001**			0.071
Yes	20(52.6)	18(47.4)		34(89.5)	4(10.5)	
No	57(17.7)	265(82.3)		248(77.0)	74(23.0)	
Symptoms of Depression			0.012			**0.011**
None	39(17.3)	187(82.7)		157(69.5)	69(30.5)	
Present	38(28.4)	96(71.6)		125(93.3)	9(6.7)	
Falls			0.064			0.091
No	28(17.1)	136(82.9)		122(74.4)	42(25.6)	
Yes	49(25.0)	147(75.0)		160(81.6)	36(18.4)	
Hospitalization			<0.001			0.431
None	52(18.3)	232(81.7)		220(77.5)	64(22.5)	
One or more	25(32.9)	51(67.1)		62(81.6)	14(18.4)	
Frailty			**<0.001**			**0.001**
Not frail	15(7.9)	175(92.1)		119(62.6)	71(37.4)	
Frail	62(36.5)	108(63.5)		163(95.9)	7(4.1)	

*Dependent; ** Independent; ***Cerebrovascular Accident.

Table 2. Factors linked to functional disability for BADL among elderly people who have been assisted at the Reference Unit for the Health of the Elderly (RUHE) (N=360) in the city of Montes Claros (Multiple Analysis). Minas Gerais, Brazil, 2015.

Independent Variables	Adjusted PR*	CI 95%**	*p*-value
Gender			
Female	1		0.03
Male	1.08	1.00-1.17	
CVA***			
No	1		0.00
Yes	1.20	1.08-1.32	
Frailty			
No	1		0.00
Yes	1.24	1.16-1.32	

(*) PR: Poisson Regression, with robust variance; (**) CI: Confidence Interval; (***) CVA: Cerebral Vascular Accident.

Table 3. Factors linked to functional disability for IADL among the elderly people receiving care at the Reference Unit for the Health of the Elderly (RUHE) (N=360) in the city of Montes Claros (Multiple Analysis). Minas Gerais, Brazil, 2015.

Independent Variables	Adjusted PR*	CI 95%**	*p*-value
Age			
Up to 79 years old	1		0.04
80 years old or more	1.06	1.00-1.14	
Literate			
Yes	1		0.00
No	1.09	1.02-1.16	
Schooling			
5 years or more	1		0.02
Up to 4 years	1.22	1.12-1.34	
Family Configuration			
Resides with spouse, partner, family or friends	1		0.00
Lives alone	0.91	0.84-0.98	
Depression			
No	1		0.00
Yes	1.09	1.03-1.16	
Frailty			
No	1		0.00
Yes	1.22	1.15-1.30	

(*) RP: Poisson Regression, with robust variance; (**) CI: Confidence Interval.

DISCUSSION

The present study calculated the prevalence of functional disability for basic and instrumental activities of daily living among elderly persons treated at a Reference Unit for the Health of the Elderly (RUHE). In addition, it provides a discussion on the social and demographic factors inherent to the health of elderly people, which can impact functional disability.

The level of functional disability for BADL was 21.4%, similar to that of a similar study conducted in Uberaba, in the state of Minas Gerais, where 17.6% of elderly people had some limitations for the execution of these activities[4]. In the case of IADL, functional disability came to 78.3%, which was higher than the results found in separate studies carried out in 2010 and 2012 in the city of Uberaba, state of Minas Gerais, which found that 46.3% and 65.9% of the elderly people, respectively, suffered functional disability for the instrumental activities studied[4,14]. This fact could be due to the fact that IADL require greater physical integrity and cognitive skills than basic activities[15].

The decline of functional capacity, as a rule, can be linked to social and demographic variables[15], as shown in the present study. It was confirmed that functional disability for BADL was associated with the male gender, the presence of sequelae of strokes and frailty. With regard to IADL, there was an association with living alone, in which case lower functional disability was observed. Among elderly people of a more advanced age; with lower levels of schooling, who are illiterate, and who show symptoms of depression, a greater level of functional disability was observed.

In terms of the link between the male gender and greater functional disability for basic activities, gender issues should be considered, as due to cultural issues many men do not carry out or do not request help to perform basic activities which include domestic chores. Therefore, the more significant functional disability among males could be a result of social

and cultural issues, rather than just associated with functional decline. Other factors that may contribute to functional disability among men include a greater exposure to risk in jobs requiring greater effort; cigarette smoking; routine ingestion of alcoholic beverages – and, as a result, the occurrence of chronic illnesses[16,17]. A study carried out in Itajurú, in the Brazilian state of Bahia, found that most males showed functional disability for the execution of these activities[16].

Even though, in the present study, functional disability mainly affected men, it is more common in literature to find that women are more afflicted by functional disability[3]. This is due to the fact that aging occurs at different paces in men and women, as men are prone to more lethal diseases, such as cardiac ischemia, while elderly women normally acquire morbidities of lower mortality but which are chronic and may lead to functional disability. In addition, elderly women seek medical services more often, use more medications, and also show greater participation in health intervention plans[13].

Elderly people who have had strokes suffer functional disability for the execution of BADL. This result is similar to that found in Goiânia, in the state of Goiás[19]. This means that functional disability related to strokes can be explained by the fact that this event has motor and sense-based consequences in the individual person, which makes walking independently and carrying out basic tasks related to self-care a more complex activity[19].

Regarding the greater functional disability for IADL among elderly people of a more advanced age, this agrees with the findings of a similar study in the municipalities of Ilhéus (Bahia), Caratinga (Minas Gerais) and Nova Santa Rosa (Paraná)[20]. As age advances, functional capacity may decline, moving from more complex activities to less troublesome ones, considering that the capacity for carrying out a task requires the combination of different physiological systems[1]. The present study found no association between functional disability and BADLs. Different results were obtained in studies carried out in the city of Teresina (Piauí) and Montes Claros (Minas Gerais), both these studies found that age was indeed linked to functional disability, both for BADLs and IADLs[21,1].

In this investigation, elderly people who were illiterate and those with few years of schooling experienced functional disability for IADL, similar to the results of a multicentric research study, that interviewed elderly people in the municipalities of Rio de Janeiro, Juiz de Fora (Minas Gerais), Campo Grande (Mato Grosso do Sul) and Cuiabá (Mato Grosso)[22]. This is justified by the fact that instrumental activities demand, from the elderly person, a certain level of literacy, as they are harder to execute fully[22].

Schooling and literacy have an influence upon the cognitive decline of the elderly person, as can be seen in a research study that evaluated institutionalized elderly people in Araxá (Minas Gerais), showing that the elderly people with lower levels of schooling suffered greater cognitive loss, which has an effect on functional disability[23].

The depressive symptoms were linked to functional disability for IADLs, which confirms the results of a study performed in Montes Claros (Minas Gerais), which identified that elderly people with symptoms of depression suffered functional disability only for instrumental activities[7]. In this study, the presence of symptoms of depression was not linked to functional disability for BADLs. This contradicts the findings of a study carried out in the city of Santo Antonio de Jesus (Bahia), which showed functional disability both for BADLs and IADLs, among people who showed symptoms of depression[24]. The functional disability related to depressive symptoms is due to the fact that activities, especially instrumental ones, require more organization and articulation in their tasks, which also involves social interaction[24].

In terms of the configuration of the family unit, it was observed that functional disability for IADLs was more common among the elderly who lived with others. This result was similar to that of the study carried out in the municipalities of Ilhéus (Bahia), Caratinga (Minas Gerais) and Nova Santa Rosa (Parana), which observed that the elderly people only had functional disability for IADLs[20]. Literature also reveals that those elderly people who lived with relatives, especially when the family unit brings together several generations, show a greater possibility of showing a decline in functional capacity

for the accomplishment of IADLs. As a possible explanation for this fact, we can mention the fact that these elderly people are often exempted from carrying out tasks that demand a greater level of complexity[20]. In other words, there may not be functional decline, but rather limited autonomy.

In the present study, frailty was a key factor in establishing functional disability, both for BADLs and IADLs. This association between frailty and functional disability is similar to that obtained in a study carried out in the city of Curitiba (PR)[25]. One probable justification for this is the fact that the elderly person exhibits greater limitations when exercising daily tasks, meaning that there is an initial decline in more complex activities, which require greater skill for development. Later, however, the elderly person may demonstrate difficulty in carrying out tasks of self-care[25,26]. A study in the city of São Carlos (São Paulo) obtained different results, however, finding that frailty was associated only with IADLs[26].

It was found that the elderly people demonstrated a reduced cognitive performance, similar to the findings of a study conducted in the city of Embu das Artes (São Paulo), where it was observed that 69.9% of the elderly people evaluated obtained a negative result in the test. Failure in the CDT can also be affected by a low level of schooling, as there is a need for basic numeracy so that the clock can be constructed and the time may be read[27].

The relevance of the CDT lies in the appraisal of many different cognitive areas, including memory; verbal understanding; capacity of planning; visuoconstructional skills; praxis and visual-spatial function, and so may indicate changes in the function of the frontal and the temporoparietal lobes[28].

The present study contained certain limitation: notably that the transversal methodological delineation makes it more difficult to establish the causal link between functional disability among elderly people and the predisposing variables discussed in the study. In addition, the study took place in a reference unit for the health of the elderly, suggesting that the sample was convenience-based, which restricts the external validity of the research, as the results can only be applied to similar populations. In addition, the health information was self-reported by the elderly patients.

Even so, despite such limitations, this study provides a suitable sample size, as necessary for the adjustment of models of regression, and also employs standardized instruments, already adapted for Brazilian culture. Research studies with a cross-sectional methodology are necessary to support local public strategies, as they provide more flexible information and can contribute to the monitoring of the real health conditions of the population.

Greater knowledge of the profile of the elderly people receiving care at the study location revealed that many suffered functional disability for some activity. This shows the need for suitably qualified health professionals who are capable of using the instruments that classify the functionality of elderly people. This in turn can enable early intervention, so as to reduce the effects of functional disability upon the quality of life of this group.

CONCLUSION

Among the elderly receiving care at the Reference Centre for the Health of the Elderly, in Montes Claros, Minas Gerais, some determining factors for functional disability for Basic Activities of Daily Life (BADLs) were identified, namely the male gender and having suffered a stroke. In contrast, functional disability for Instrumental Activities of Daily Life (IADLs) was established by factors such as: being literate; having lived longer; evidence of symptoms of depression; and living with spouses, partners, families or friends. Finally, functional disability, both for Basic and Instrumental Activities, was also determined by the frailty exhibited among the elderly people evaluated. Some degree of cognitive decline was also seen among many of the elderly people.

It is therefore essential that health professionals employ their knowledge and fulfill their role when dealing with elderly people, making use of the available tools and care systems, so as to ensure autonomy in the full evaluation of this group, as well as applying interventions in situations that present a risk for the elderly person.

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